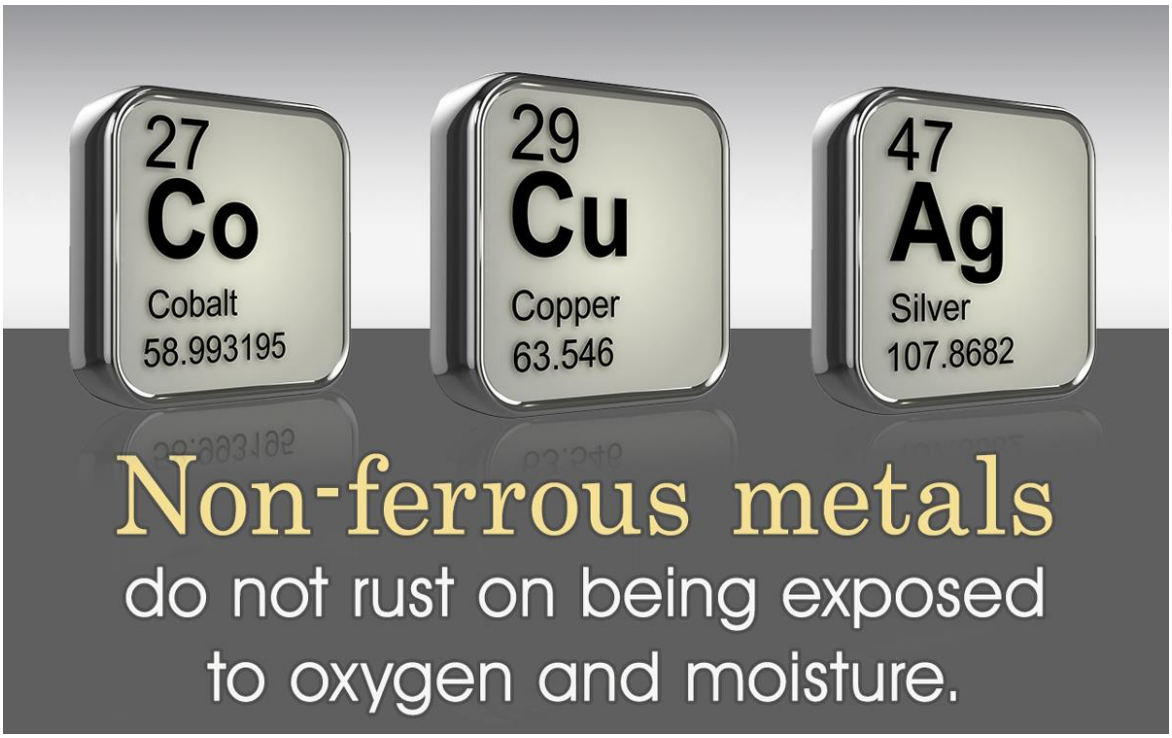
Metals List…

Non-ferrous Metals List



What are non ferrous metals? Well, read all about them and check out the non ferrous metals list provided in the following article to get a clearer understanding.

To put it simply, non-ferrous metals are all those metals that do not contain any amount of iron and, therefore, lack two of the most prominent properties of iron – magnetism and corrosion on exposure to oxygen, whether atmospheric or in any other form. In other words, owing to the complete absence of iron, these metals do not attract, nor are they attracted to, magnets. These metals also do not rust like iron does on being exposed to oxygen and moisture. Got the catch yet? That just means they can be

processed or manipulated to be made into building materials that are far more durable than iron due to their resistance to corrosion! That being said, I'm sure you must have come up with at least a couple of names by now in the non-ferrous category of metals. If not, there's always the following list that you can refer to in order to know which metals lack iron content and are, hence, devoid of the ability to corrode and are indifferent towards magnets and the effects of magnetism.

List of All Non-ferrous Metals

While there are a lot of naturally occurring metals and metal alloys that come under the category of non-ferrous metals, a decent number of metallic compounds have been created by mankind, especially during the last few decades, in a bid to come up with better, stronger and more corrosion resistant alternatives to iron as a building, fortifying and construction materials for buildings, instruments, transportation vessels and vehicles, etc. Here's a list that I could come up with at this moment. Hope I didn't miss out on any possibly significant entrant!

- Aluminum
- Zinc
- Copper
- Lead
- Chromium
- Lithium
- Vanadium
- Ruthenium
- Beryllium

- Titanium
- Sodium
- Magnesium
- Scandium
- Potassium
- Calcium
- Manganese
- Molybdenum
- Lanthanum
- Barium
- Bismuth
- Cobalt
- Niobium
- Nickel
- Zirconium
- Gallium
- Yttrium
- Rubidium

- Strontium
- Cesium
- Technetium
- Antimony
- Osmium
- Rhodium
- Indium
- Palladium
- Silver
- Gold
- Cadmium
- Thallium
- Hafnium
- Mercury (but of course!)
- Tantanum
- Tin
- Platinum
- Tungsten

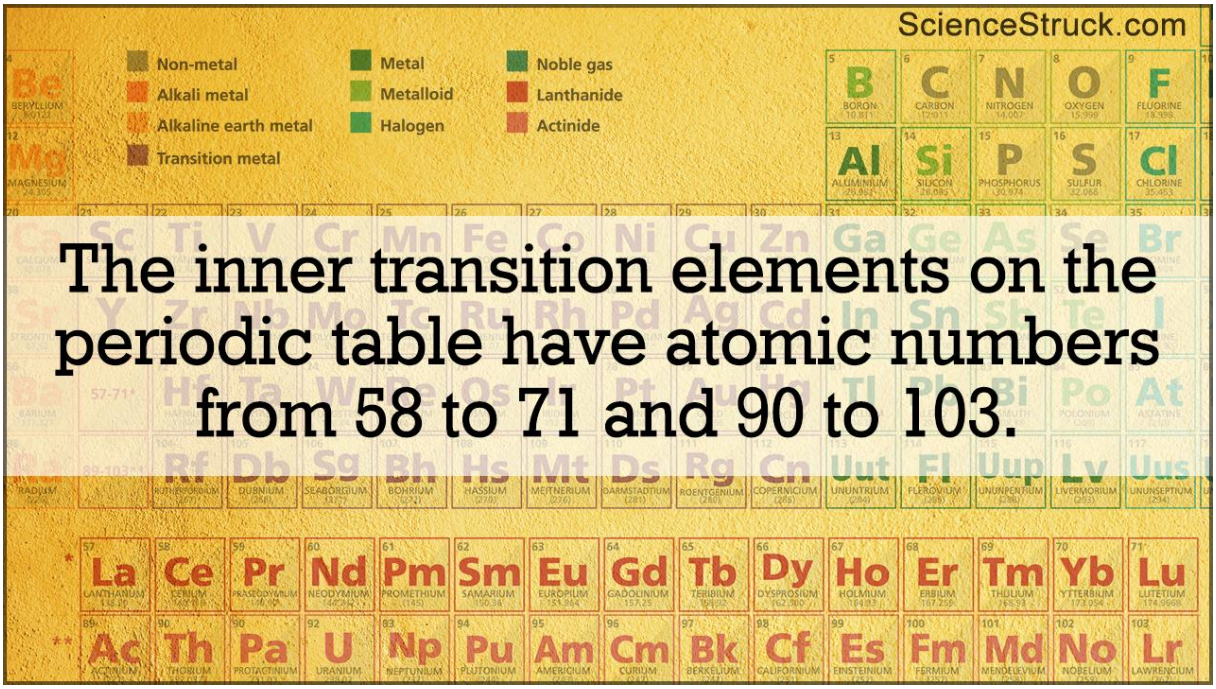
- Iridium
- Rhenium

Tin is one metal which cannot be specifically put under either ferrous or non-ferrous category. Although it does not have any iron content, it does exhibit paramagnetic (white tin) and diamagnetic (gray tin) properties. Also, it does not rust like iron. In case you're wondering what made me mention *gold* in this list, let me tell you that gold in its purest form is NEVER ferrous! Only when ferrous impurities get introduced to the alloy does gold show certain, very slight ferrous properties. Imagine pure gold being a ferrous metal – all you would ever need to do to mine gold from an aquatic source is to drag a magnet along the water and bingo… the gold itself would come to you pulled by magnetic force!

Alloy metals such as ***Duralumin*** (which is composed of a combination of copper and manganese in a 4:1 ratio besides aluminum), *brass* (which is 35% zinc and 65% copper) and *Gliding metal* (an alloy of 15% zinc and 85% copper) are some of the most prominent non-ferrous metal examples that are made by combining two or more other non-ferrous base metals. All these alloys share the same two basic non-ferrous qualities with their base metallic components – indifference towards magnets and resistance to corrosion.

That reminds me to share an interesting fact regarding magnetism of metals with you. Do you know what makes a metal magnetic? Well, on the molecular, or rather, atomic level, a metal can have either paired or unpaired electrons (I am assuming you know all about electrons, protons, neutrons and their charges). When a spin-down electron has a corresponding spin-up electron and vice versa, it's called paired and when there is an absence of a corresponding electron for either a spin-up or a spin-down one, the electron is known as unpaired. A metal that has an atomic structure in which at least one electron is missing a corresponding spin-up or spin-down becomes a magnetic metal!

Inner Transition Metals



A very well-known group in the periodic table is that of inner transition metals. Let's find out the names and properties of these metals through this ScienceStruck article.

The Other Name

In some instances the other name given to these elements is **f-block elements**.

In the modern periodic table, which is based on the atomic number and electronic configuration of the elements, there are rows and columns which are prepared to organize these elements found in nature. It was designed by the Russian chemist, Dmitri Ivanovich Mendeleev, and the German physicist,

Julius Lothar von Meyer in different formats, almost at the same time, but with a few variations.

According to the new table, the rows are known as the "periods", and the columns are known as the "groups." It is based on these periods and groups that the 103 elements in nature are classified. In this article, we are going to read about two periods in the periodic table which occupy 30 chemical elements and are called the inner transition metals. These are subcategorized by two individual series called the Lanthanoids and Actinoids and they occupy the last two individual periods of the table i.e. the 'f' block. Find some basic facts about these metals from the paragraphs below.

The Periodic Table

According to the definition, they are referred to as "those elements which occupy the 'f' block and are commonly known as the Lanthanoids and Actinoids." They belong to the 6 and 7 periods of the periodic table but are usually shown separately under the other elements. The Lanthanoid series, includes about 14 elements from the atomic number 58 to 71, following Lanthanum which has atomic number, 57.

Similarly, in the Actinoide series, there are 14 elements having the atomic numbers 90 to 103, and they too follow the actinium, that has the number 89. These metals in Chemistry are put together, because they have very similar properties and thus they are used for similar purposes as well.

The List

Earlier these metals were known as the Lanthanides and the actinides, but later the International Union of Pure and Applied Chemistry (IUPAC), decided to change them to Lanthanoids and Actinoids, as the suffix "-ide" refers to anions in chemistry. There are two tables mentioned below, where you will find the names, atomic numbers and the symbols for these two periods which are popularly known in the periodic table.

Lanthanoids		
Name	**Symbol**	**Atomic Number**
Lanthanum	La	57
Cerium	Ce	58
Praseodymium	Pr	59
Neodymium	Nd	60
Promethium	Pm	61
Samarium	Sm	62
Europium	Eu	63
Gadolinium	Gd	64
Terbium	Tb	65
Dysprosium	Dy	66
Holmium	Ho	67
Erbium	Er	68
Thulium	Tm	69
Ytterbium	Yb	70
Lutetium	Lu	71
Actinoids		
Name	**Symbol**	**Atomic Number**
Actinium	Ac	89
Thorium	Th	90
Protactinium	Pa	91

Uranium	U	92
Neptunium	Np	93
Plutonium	Pu	94
Americium	Am	95
Curium	Cm	96
Berkelium	Bk	97
Californium	Cf	98
Einsteinium	Es	99
Fermium	Fm	100
Mendelevium	Md	101
Nobelium	No	102
Lawrencium	Lr	103

** The elements Lanthanum and Actinium have been included in the table, although both these metals are not f-block elements, because they display properties similar to that of the f-block elements.*

Properties of the Metals

The Lanthanoids and the Actenoids are used for a various purposes, as they are extremely strong and durable elements. The Lanthanoid elements are extremely similar to each other and used in making lasers, sunglasses, magnets for commercial purposes, etc. The elements which follow Actinium are also very similar in chemical and physical properties. Uranium and plutonium uses are in nuclear weapons and most of the other elements in this period are produced through nuclear reactions.

Lanthanoids: There are 14 elements which follow Lanthanum (La, 57) and start from Ce (58) to Lu (71). According to Lanthanum facts, all the elements in

this series include +3 ions, which is why they are similar to each other in physical and chemical properties. They all react with water to release hydrogen and most of them are used to make lasers. They also have magnetic properties, which is why they are combined with other metals to make strong magnets.

Actinoids: In this series of elements, due to the closeness of the energy levels, they are very unstable and have different oxidation states like +3, +4, +5, +6. Because of these varying states, most of the elements acquire radioactive powers and thus can be used in nuclear reactors, in dating techniques, which help in determining the age of fossils. The elements like uranium, thorium, americium and plutonium are included in the list of radioactive elements and used in these nuclear reactors.

Comprehensive List of Ferrous Metals and Their Uses

Cast iron is normally used in the manufacture of heavy crushing machinery, machine tool parts, brake drums, car cylinder blocks, machine handles, gear wheels, plumbing material, as well as several household items.

Did You Know?

The amount of ferrous scrap processed daily in the US alone, is equivalent to that required for building 25 Eiffel Towers!

Chemical elements are broadly classified into two major groups-metals and non-metals. Metals are further divided into two main groups:
(1) Ferrous Metals
(2) Non-ferrous metals

The term 'ferrous' comes from the Latin word *ferrum*, meaning 'containing iron'. These metals are generally magnetic in nature and have a high tensile strength. Iron and steel in all forms are viewed as ferrous metals, while metals that don't constitute an iron component in them are termed as non-ferrous.

Ferrous metals may contain small amounts of other elements such as carbon or nickel, that are added (in a specific proportion) to achieve the desired properties.

These metals are present almost everywhere, be it the Eiffel tower or the intricately carved metal gates. Almost all are widely employed in the manufacturing of products like beams, machine parts, cookware, gadgets, etc.

List of Ferrous Metals

Carbon Steel

Carbon steel is a ferrous alloy with 0.05 to 2.0% carbon, and is known for its high tensile strength. It can be hardened to heat treatment, and is fairly ductile. Depending on the carbon content, carbon steel has been classified into three broad types. As the carbon content increases, the strength increases, but the ductility reduces. However, carbon steel is susceptible to rusting.

► Low-carbon Steel

- Also known as mild steel, it is the most commonly used ferrous metal.
- It Contains about 0.05 to 0.30% carbon and the rest is iron.
- It is malleable and ductile, and bends easily.
- It is used in the manufacture of nuts, screws, bolts, girders and other general metal products.

► Medium-carbon Steel

- It contains about 0.30 to 0.60% carbon.
- It is relatively harder and less ductile than low-carbon steel.
- It is used in the manufacture of car components like axles, gears and crankshafts.

► High-carbon Steel

- It contains 0.60 to 0.99% carbon, and may also contain small amounts of manganese, silicon, and copper.
- It is the strongest and hardest of all carbon steels.
- It is used to make blades, springs, and high-strength wires.

► Tool Steel

▪ Also known as tool and die steel, it is specifically used for making machine parts, metal cutting tools and dies, as well as molds used for injection molding.
▪ It contains 0.7 to 1.5% carbon, as well as molybdenum, tungsten, vanadium, and other metals.
▪ It is resistant to heat, abrasion, and corrosion, unlike other carbon steels.

Stainless Steel

▪ Also known as corrosion-resistant steel, it is an alloy of iron, nickel, and chromium.
▪ The important property of stainless steel is its high resistance to corrosion owing to the presence of chromium.
▪ It is tough and resistant to stains, hence, called stainless steel.
▪ This steel can be welded, machined and shaped easily depending on the type of steel.
▪ It is commonly used in kitchen cutlery and cookware, axles, desks, nails, medical instruments, kitchen draining boards, pipes, etc.

Cast Iron

▪ It is strong but brittle, and has a high compressive strength.
▪ It is resistant to oxidation and corrosion.
▪ It can be classified into different varieties like gray cast iron, white cast iron, malleable cast iron, and ductile cast iron.
▪ Cast iron can be bronze-welded or arc-welded, and hardened or machined.

Wrought Iron

▪ Wrought iron has a very low carbon content of 0.10 to 0.25%.
▪ It is strong and tough, yet fibrous and ductile.
▪ It is no longer produced commercially, and has been replaced by mild steel.

▪ It was used to make ornamental gates, farm and garden equipment, railings, nails, wires, etc.

Characteristics of Metals

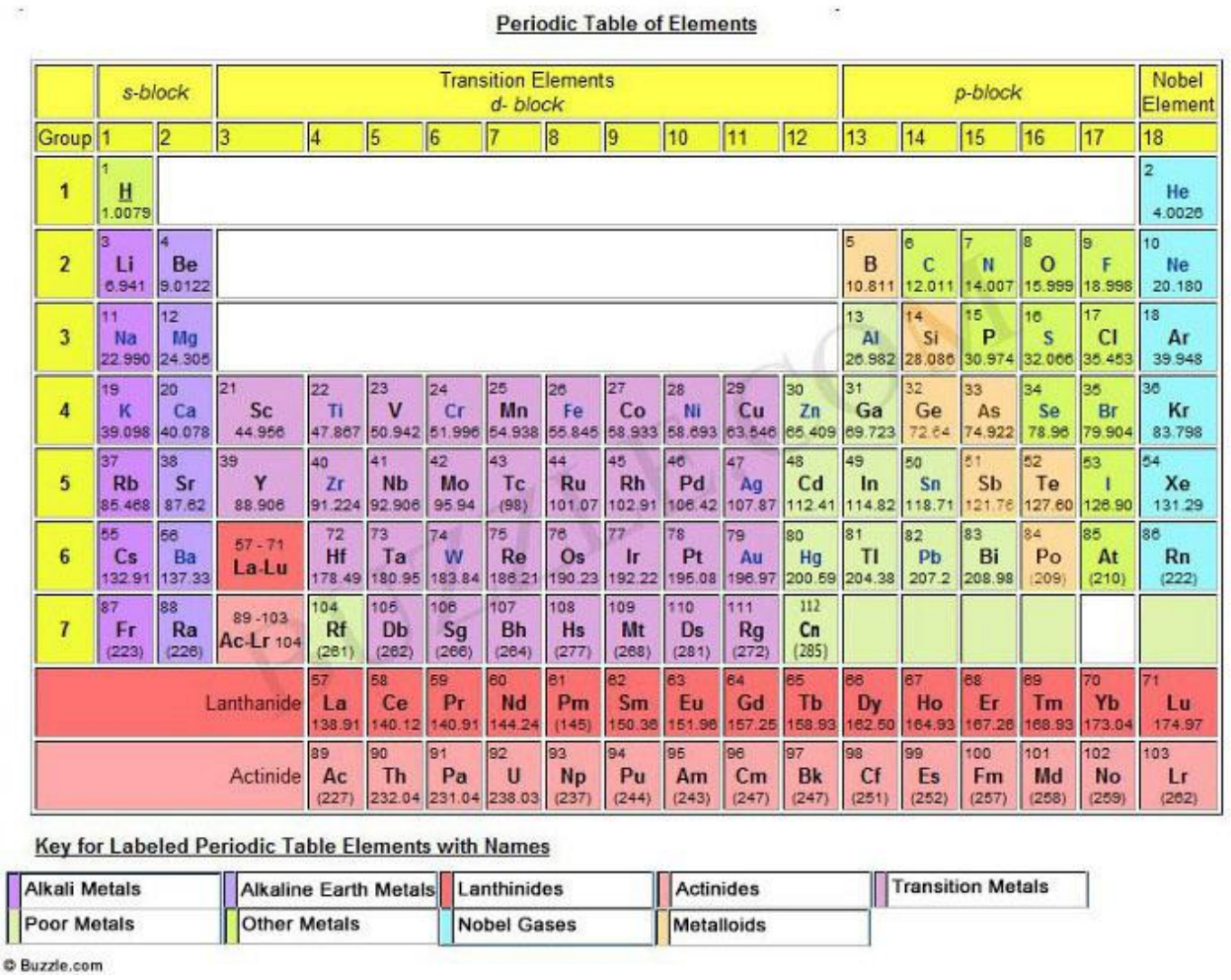
► Are malleable (can be shaped through hammering).
► Are ductile (can be drawn into wires).
► Have high tensile strength.
► Are good conductors of heat and electricity.
► Have a lustrous appearance.
► Have high melting points.

Properties of Alkali Metals

What's common between sodium and lithium? Well, they belong to the same group in the periodic table, and the members of this group (there are 6 elements in all) are known as alkali metals. This ScienceStruck article talks about the physical and chemical properties of these elements.

Alkali metals belong to the Group 1 of the periodic table. Being highly reactive in nature, they are mostly found in the form of compounds and not in elemental form. The members of this group, arranged in the increasing order of their atomic numbers, are **Lithium (Li), Sodium (Na), Potassium (K), Rubidium (Rb), Cesium (Cs)**, and **Francium (Fr).**

If you have a look at the **periodic table** given below, you'll see that hydrogen is placed at the top of the alkali metals group. However, it's a non-metal and does not belong to the group. Most of the properties of hydrogen are very different from those of the alkali metals. Only under extremely high pressure, hydrogen shares some properties with the members of this group.



Physical Properties

Many of the physical properties of alkali metals are very similar to that of other metals. However, there are certain physical properties that make them different from other elements.

- The densities of alkali metals are much lower when compared to other metals.

- Unlike other metals, the elements of the alkali metal group are soft substances and can be cut with a knife.
- In any given period of the periodic table, the atomic radii of the alkali metals is the largest, and the atomic radius increases as one moves down the group.
- The members of this group have low ionization energies, which is the energy required to remove the outermost electron from the orbit. The ionization energy decreases as one moves down the group.
- They are good conductors of heat and electricity.
- They have very low boiling and melting points.
- Except for cesium, which has a light golden color, alkali metals are silvery white in color.
- They are lustrous and have a shiny surface.
- They are highly malleable and ductile, which means they can be easily drawn into thin wires or beaten into thin sheets.
- They form colored flames when burning in oxygen.
- Two of the group's members, potassium and rubidium exhibit weak radioactive properties.

Chemical Properties

The alkali metals are highly electropositive, which means they readily lose their electrons to form a univalent cation (positive ion), and hence, are highly reactive. This is because of the presence of a loosely bound single electron in the outermost shell of these metals. The chemical reactivity of alkali metals increases as we move down the group. They easily react with other elements, especially halogens, to form ionic compounds. Alkali metals also have a strong reducing property. Following are some of the important reactions of alkali metals:

1. Reaction with Oxygen

Any alkali metal, on coming in contact with air or oxygen, starts burning and oxides are formed in the process. At the end of the chemical reaction, lithium gives lithium monoxide (LiO), sodium gives sodium peroxide (Na_2O_2), and other alkali metals give superoxides (that is, each alkali metal atom forms bonds with two oxygen atoms). Oxides of alkali metals are basic in nature and are soluble in water, forming alkali metal hydroxides when dissolved into water.

The table below enlists the color of the flame emitted when the alkali metals burn in oxygen.

Alkali Metal	**Flame Color**
Lithium (Li)	Crimson
Sodium (Na)	Intense Yellow
Potassium (K)	Lilac
Rubidium (Rb)	Red-violet
Cesium (Cs)	Blue-violet

Actually, these metals have a shiny surface but they get tarnished very easily, as a result of oxidation with the atmospheric oxygen and their appearance becomes dull.

2. Reaction with Hydrogen

When alkali metals react with hydrogen, then ionic hydrides are formed. The ionic nature of the hydrides increases as we move down from lithium to cesium. The stability of the hydrides thus formed, reduces with the increase in the atomic numbers of alkali metals. These hydrides have strong reducing properties.

3. Reaction with Halogens

Alkali metals react with elements of the halogen group (Group 17 of the periodic table) to form halides. Except lithium iodide, all other halides are ionic in nature. To some extent, lithium iodide is covalent in nature as the bonding occurs between the smallest cation and the largest anion. As a result, the large iodide anion gets polarized. All the halides except lithium fluoride (LiF) readily dissolve in water.

4. Reaction with Water

Alkali metals react with water to form hydroxides, and hydrogen gas is released in the process. The reaction is so vigorous in nature that the hydrogen gas produced during the reaction catches fire. Lithium is the only alkali metal that reacts slowly with water. The hydroxides possess strong basic properties. The strength of the basic properties of alkali metal hydroxides increases with a rise in the atomic number of these metals.

The knowledge of all these distinctive properties of alkali metals helps us to prepare a large variety of essential alkali metal compounds. Sodium hydroxides, sodium chloride, and sodium carbonate are some of the most useful compounds that are used in various industries.